

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claim 1 was canceled. Claims 10-21 and 29-37 are withdrawn. Claims 2-9 and 22-28 are pending.

Cancel claims 5-8 and 23-24.

Amend claims 2, 4, 22, 25, and 27 as follows.

Listing of Claims:

1 1. (canceled)

1 2. (currently amended) The apparatus as recited in claim 5 [4]
2 further comprising:
3 means for dynamic management of the windows.

1 3. (previously presented) The apparatus as recited in claim 2
2 further comprising:
3 means for using historical values in present said windows to help
4 populate inserted said windows.

1 4. (currently amended) An apparatus for monitoring time series,
2 comprising:
3 one or more registers each comprising a ring buffer for
4 simultaneously storing a set of a plurality of received data points of a
5 corresponding time series, wherein at least one register comprises one or
6 more windows each corresponding to a subset of the set of received data
7 points of the register's corresponding time series and wherein the subset
8 changes with each received data point of the corresponding time series,
9 each window for maintaining statistics for the corresponding subset and
10 updating the statistics via online computation to account for data points of

11 the corresponding time series moving into and out of the corresponding
12 subset;

13 means for receiving data points of one or more time series and
14 storing the received data points in the corresponding registers;

15 means for receiving query strings representing queries;

16 means for compiling the received query strings into persistent
17 queries;

18 at least one said persistent query, each defining a query
19 represented by received said query strings, each persistent query being a
20 function of the time series of corresponding one or more trigger registers
21 of the one or more registers, and wherein at least one persistent query
22 defines an event condition and a payload specification of the defined
23 query and at least one of the event condition and the payload specification
24 of the at least one persistent query is a function of the statistics
25 maintained by at least one window of at least one of the corresponding
26 one or more trigger registers;

27 means, responsive to storing of a received data point in a trigger
28 register, for evaluating each persistent query corresponding to the trigger
29 register; and

1 means for outputting a payload of each evaluated persistent query
2 whose event condition has a first value.

1 5. (canceled)

1 6. (canceled)

1 7. (canceled)

1 8. (canceled)

1 9. (previously presented) The apparatus of claim 4 comprising:

2 means for dynamic management of persistent queries.

1 10. **(withdrawn)**

1 10. **(Withdrawn)** An apparatus monitoring time series, comprising:

2 means for receiving data points of one or more time series;

3 one or more registers each corresponding to a different one of the
4 time series, each register comprising

5 a buffer for storing a plurality of most-recently received data points
6 of the corresponding time series, and

7 one or more windows, each associated with a subset of the
8 register's corresponding time series, for maintaining statistics for the
9 associated subset;

10 one or more persistent queries each corresponding to one or more
11 trigger registers of the one or more registers and defining an event
12 condition and a payload specification that expresses data that are to be
13 output when the event condition evaluates to a first value;

14 means, responsive to a trigger register storing a newly-received
15 data point, for evaluating the event condition of each persistent query
16 corresponding to the trigger register; and

17 means for outputting the output data specified by the payload
18 specification of each persistent query whose event condition evaluates to
19 the first value.

1 11. **(Withdrawn)** The apparatus of claim 10 further comprising:

2 means, responsive to receipt of a data point of a time series, for
3 storing the data point in the buffer of individual said register corresponding
4 to the data point's time series; and

5 online computation means, responsive to the means for storing, for
6 updating the statistics of the windows of the individual register to account
7 for the stored data point.

1 12. **(Withdrawn)** The apparatus of claim 11 wherein:
2 the means for storing comprise
3 a register basic lock;
4 a register booster lock;
5 a window lock; and
6 a query lock.

1 13. **(Withdrawn)** The apparatus of claim 11 wherein:
2 at least one of the event condition and the payload specification of
3 at least some persistent queries are a function of the statistics of the
4 windows of the trigger registers of the at least some persistent queries.

1 14. **(Withdrawn)** The apparatus of claim 10 wherein:
2 the means for receiving comprise
3 an input for receiving a stream of data values each labeled to
4 indicate the time series to which the data value belongs;
5 a filter for determining from each data value's label whether the
6 data value belongs to a time series monitored by the apparatus and
7 discarding those data values that do not belong to a monitored series; and
8 a sequencer for supplying a unique identification number to each
9 filtered data value.

1 15. **(Withdrawn)** The apparatus of claim 14 further comprising:
2 means for storing the filtered data value accompanied by the
3 unique identification number and a timestamp in the buffer of the individual
4 register corresponding to the data value's time series; and
5 online computation means, responsive to the means for storing, for
6 updating the statistics of the windows of the individual register to account
7 for the stored filtered data value.

1 16. **(Withdrawn)** The apparatus of claim 10 comprising:

2 means for adding a register to the apparatus.

1 17. **(Withdrawn)** The apparatus of claim 10 comprising:
2 means for adding a window to a register of the apparatus.

1 18. **(Withdrawn)** The apparatus of claim 17 wherein:
2 the means for adding a window comprise
3 a register basic lock;
4 a register booster lock; and
5 a window lock.

1 19. **(Withdrawn)** The apparatus of claim 10 comprising:
2 means for dynamic management of persistent queries.

1 20. **(Withdrawn)** The apparatus of claim 10 further comprising:
2 an input for receiving a query;
3 a parser for parsing the query into one or more query strings
4 corresponding to the payload specification, the event condition, and the
5 one or more trigger registers; and
6 means for compiling the query strings into a persistent query.

1 21. **(Withdrawn)** The apparatus of claim 20 further comprising a
2 query lock.

1 22. **(currently amended)** A computer-implemented method of
2 monitoring time series, comprising:
3 receiving query strings representing a query;
4 compiling from the received strings a persistent query defining the
5 represented query as a function of one or more time series;
6 receiving data points of the one or more time series;

7 storing the received data points each in a register comprising a ring
8 buffer for simultaneously storing at set of a plurality of received data points
9 of a corresponding one of the one or more time series, wherein at least
10 one register comprises one or more windows each corresponding to a
11 subset of the set of received data points of the register's corresponding
12 time series and wherein the subset changes with each received data point
13 of the corresponding time series;

14 maintaining statistics for any windows of the registers that store the
15 received data points and updating the statistics via online computation to
16 account for the data points of the corresponding time series moving into
17 and out of the corresponding subsets;

18 in response to storing of a received data point in a register, using
19 contents of the register to evaluate each persistent query that is a function
20 of the register's corresponding time series, including using contents of the
21 at least one window to evaluate at least one of an event condition and a
22 payload specification of the persistent query that is a function of the at
23 least one register's corresponding time series, where the at least one of
24 the event condition and the payload specification is a function of the
25 statistics for the at least one window of the at least one register; and

26 outputting a payload of each evaluated persistent query whose
27 event condition has a first value.

1 23. (canceled)

1 24. (canceled)

1 25. (currently amended) The method of claim 2322 wherein
2 updating statistics comprises;
3 performing online computation of the statistics.

1 26. **(previously presented)** The method of claim 22 further
2 comprising:
3 dynamically managing the persistent queries.

1 27. **(currently amended)** The method of claim ~~23~~22 further
2 comprising:
3 dynamically managing the windows.

1 28. **(previously presented)** The method of claim 27 further
2 comprising:
3 using historical values in present said windows to help populate
4 inserted said windows.

1 9. **(Withdrawn)** A method of monitoring time series, comprising:
2 associating each of one or more registers with a corresponding
3 time series of one or more time series:
4 including in each said register one or more windows each
5 associated with a subset of the register's corresponding time series and
6 maintaining statistics for the associated subset;
7 forming one or more persistent queries each corresponding to one
8 or more trigger registers of the one or more registers and defining an
9 event condition and a payload specification that expresses data that are to
10 be output when the event condition evaluates to a first value;
11 receiving a data point of one of the one or more time series;
12 in response to the receiving, storing the received data point in a
13 buffer for storing a plurality of most-recently received data points of the
14 one time series, of a register that corresponds to the one data series;
15 in response to a buffer of a trigger register storing a newly-received
16 data point, evaluating the event conditions of each persistent query
17 corresponding to the trigger register; and

18 outputting the output data specified by the payload specification of
19 each persistent query whose event condition evaluates to the first value.

1 30. **(Withdrawn)** The method of claim 29 further comprising:
2 in response to the buffer of one of the registers storing the newly-
3 received data point, updating statistics of the windows of the one
4 register to account for the stored data point.

1 31. **(Withdrawn)** The method of claim 30 wherein:
2 evaluating the event conditions comprises
3 evaluating at least one of the event condition and the payload
4 specification of at least some of the persistent queries corresponding to
5 the trigger registers as a function of the statistics of the windows of the
6 trigger registers of the at least some persistent queries.

1 32. **(Withdrawn)** The method of claim 29 wherein:
2 receiving a data point comprises
3 receiving a stream of data values each labeled to indicate the time
4 series to which the data value belongs;
5 determining from each data value's label whether the data value
6 belongs to a time series monitored by the method and discarding those
7 data values that do not belong to a monitored series; and
8 supplying a unique identification number to each data value that is
9 not discarded.

1 33. **(Withdrawn)** The method of claim 32 further comprising:
2 storing the not-discarded data value accompanied by the unique
3 identification number and a timestamp in the buffer of the register
4 corresponding to the data value's time series; and

5 in response to the storing, performing online computation to update
6 the statistics of the windows of the register to account for the stored data
7 value.

1 34. **(Withdrawn)** The method of claim 29 comprising:
2 adding a register to the one or more registers.

1 35. **(Withdrawn)** The method of claim 29 comprising:
2 adding a window to a register to the one or more registers.

1 36. **(Withdrawn)** The method of claim 29 comprising:
2 dynamically managing persistent queries.

1 37. **(Withdrawn)** The method of claim 29 wherein:
2 forming one or more persistent queries comprises
3 receiving a query;
4 parsing the query into one or more query strings corresponding to
5 the payload specification, the event condition, and the one or more trigger
6 registers; and
7 compiling the query strings into a persistent query.